4.7 Identity and Inverse Matrices

Identity Matrix--square matrix that when multiplied by another matrix, it equals that same matrix.

$A \cdot I = A \qquad I \cdot A = A$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Inverse matrices--are 2 square matrices whose product is the identity

A^{-1} -- "A inverse"

$$A \cdot A^{-1} = I$$
$$A^{-1} \cdot A = I$$

Are they inverses? yes

$A = \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}$ 2x2 $\qquad B = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$ 2x2

$A \cdot B \stackrel{?}{=} I \qquad B \cdot A \stackrel{?}{=} I$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Are they inverses? NO

$C = \begin{bmatrix} 3 & -1 \\ 4 & -2 \end{bmatrix} \qquad D = \begin{bmatrix} 1 & -3 \\ 2 & 4 \end{bmatrix}$

$C \cdot D = I \qquad D \cdot C = I$

$\begin{bmatrix} 1 & -13 \end{bmatrix}$

Finding the inverse.

If D = 0, there is no inverse.

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \qquad A^{-1} = \frac{1}{D}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Find the inverse.

$A^{-1} = \begin{bmatrix} \frac{3}{22} & \frac{-2}{11} \\ \frac{1}{22} & \frac{3}{11} \end{bmatrix}$

$A = \begin{bmatrix} 6 & 4 \\ -1 & 3 \end{bmatrix}$ -4 18 $D = 22$ $A^{-1} = \frac{1}{22}\begin{bmatrix} 3 & -4 \\ 1 & 6 \end{bmatrix}$

$B = \begin{bmatrix} -1 & 0 \\ 8 & -2 \end{bmatrix}$ $D = 2$ $B^{-1} = \frac{1}{2}\begin{bmatrix} -2 & 0 \\ -8 & -1 \end{bmatrix}$ $\begin{bmatrix} -1 & 0 \\ -4 & -\frac{1}{2} \end{bmatrix}$

$\begin{bmatrix} -4 & 6 \\ -2 & 3 \end{bmatrix}$ $D = 0$ No inverse

HW
p199
10-13, 16-25